IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Applicant: **Noorbakhsh, et al.** Case: **4150D1/ETCH/DRIE/JB1**

Serial No.: **10/055,310** Filed: **January 22, 2002**

Examiner: **Alejandro Mulero, Luz L.** Group Art Unit: **1763**

Confirmation No.: **9294**

Title: **TEMPERATURE CONTROLLED SEMICONDUCTOR PROCESSING CHAMBER LINER**

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

S I R:

DECLARATION OF TODD PATTERSON UNDER 37 C.F.R. §1.132

I, Todd Patterson, declare as follows:

1. I am the attorney to which the attached instruction letter and invention alert from Applied Materials is addressed. (See Exhibit A)

2. Exhibit A is a copy of an invention alert that we received from the Applied Materials Patent Department as part of an invention disclosure that forms the basis of the present application, the Invention alert indicating conception and reduction to practice of the claimed invention was received by my firm before September 23, 1999. All masked dates in Exhibit A are prior to September 23, 1999.

3. The subject matter of Exhibit A was diligently prepared and filed as U.S. Patent Application Serial No. 10/055,310 beginning at a time prior to September 23, 1999, until the filing date of priority application Serial No. 09/519,719.

4. Exhibit A shows that the invention which forms the subject matter of the pending claims in the above-captioned patent application was conceived before September 23, 1999, and diligently reduced to practice by at least March 7, 2000, the filing date of priority application Serial No. 09/519,719.

5. Exhibit A includes a description of a thermally controlled apparatus for lining a processing chamber that defines a processing volume having – as recited in, for example, claim 1 – a base for substantially covering a bottom of the chamber and an inner wall connected to and extending upward from an inner side of the base. A substantially annular passage is formed in the base, the inner wall, or the base and the inner wall. The passage has an inlet and an outlet adapted to circulate a fluid through the passage. The passage is fluidly isolated from the processing volume. (*See, Exhibit A*, pages 3-5, paragraphs 7-8 and Figures 1-3.)

6. Exhibit A is offered as supporting evidence that the apparatus of the present invention was conceived before September 23, 1999, the earliest publication date of PCT Application No. WO 99/48130 which published September 22, 1999 to *Pu et al.*, and diligently reduced to practice by filing the priority application.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under

Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

4/14/05
Date

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10

⟨DATE⟩

Thomason, Moser, and Patterson
Mr. Todd Patterson
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Fax: 713-623-4846

PATTERSON
⟨DATE⟩
RECEIVED

Applied Materials Docket No. 004150 ALRT / ETCH:/IPS/MXP/PJS
Title: Direct Temperature Controlled Chamber Liners Design To Prevent Polymers From Flaking And To Reduce Particle Contamination On The Wafers
Inventors: Hamid Noorbakhsh, Siamak Salimian, Paul E Luscher, James D Carducci, Evans Y Lee

Dear Todd,

Please prepare a patent application for filing in the U.S. in connection with the above-identified docket. Please commence with the preparation of the application at your earliest convenience. I am enclosing a copy of the above-identified disclosure.

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Please confirm receipt of this alert, identifying your reference number and the attorney who will write this case via e-mail.

Prior to filing this case, please investigate the facts to confirm whether there is a statutory bar deadline and to identify the proper inventors. After you have investigated the possible disclosure circumstances, please advise us of the filing deadline for this case via e-mail. We would also like you to verify the situation relative to foreign filing, i.e. has there been a public disclosure of the invention without the benefit of a confidential disclosure agreement.

CONFIDENTIAL

DOCKETED
⟨DATE⟩
BY

4. You are authorized to begin work immediately.

Thank you very much for your assistance with this U.S. patent application.

Sincerely,
Applied Materials, Inc.

INVENTION ALERT FC 4

ENTERED (DATE)

TO: Gaile Bailey MS 2061
Extension: 32714
Current Date: (DATE)

ALERT NO: 4150

CIRCLE ONLY ONE APPLICABLE DIVISION AND PRODUCT BUSINESS GROUP(PBG)
PLEASE SUBMIT ONE ORIGINAL, SIGNED DOCUMENT FOR RECORDING. IF THIS IS A COPY OF A PREVIOUSLY SUBMITTED ALERT, PLEASE MARK IT ACCORDINGLY

CONFIDENTIAL

Please use separate attachments for any answers that don't fit on the form, especially for questions 3-8. If the answer to a question is "NONE", please write "NONE" rather than leaving the answer blank.

1. Title of Invention (please print clearly): **DIRECT TEMPERATURE CONTROLLED CHAMBER LINERS DESIGN TO PREVENT POLYMERS FROM FLAKING AND TO REDUCE PARTICLE CONTAMINATIONS ON THE WAFERS**

2. Inventors-Names only-(please print clearly and provide complete information at Section 9.)

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(DATE)

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7. List each feature of the invention which you consider novel and non-obvious. Describe the advantages of each novel feature in comparison with the state-of-the-art approaches which are most similar to your invention:

There are two main liners in the e Max vacuum chamber which are directly exposed to the plasma and thus polymer deposition. The first one is the Cathode Liner that drops in from the top and covers the cathode assembly and the bottom of the chamber. The second one is the Chamber Liner that drops in from top and forms the reactor dome and vacuum seal to the chamber body. The Chamber Liner holds the gas injectors and cover all of the reactor interior body. In the old generation of the chambers (MxP+, eMxP+ family), the water channels were welded into the exterior of the chamber walls. The old Chamber Liner had only small contact to the water cooled chamber from the bottom of the liner flange to the O-Ring sealing surface of the chamber body. The cooling of the Chamber Liner primarily was done through this small contact area. The heat conduction through contact is very poor and irreproducible due to pressure and surface topography variations. The new aluminum Chamber Liner has water channels directly machined in them thus keeps the aluminum liner at a much more reproducible with much smaller temperature excursion during processes (Figures 1 & 2).

The old Cathode Liners also were dropped in from top over the cathode and were submerged completely in the vacuum. The only contact to the water cooled chamber was through contact at the bottom of the Liner. The thermal contact in vacuum is very poor and the delta temperature of 40°C has been measured across the interface. The contact resistance of the Liner's base to the chamber also depending on the flatness, surface finish and contact force, but these are the second order effects on the heat transfer in the vacuum environment compared to the new directly cooled or temperature controlled liners. The new Cathode Liner is directly cooled by running the coolant inside the material. The coolant lines are attached with two quick disconnect fittings (in & out) to the bottom of the Cathode Liner through the access holes at the bottom of the chamber. The channels are drilled in angled configurations at the bottom of the Liner to prevent any welding or brazing of the Liner in the vacuum chamber. The coolant enters and exits from the bottom of the aluminum Liner and keeps it at much more reproducible temperature and with much smaller temperature excursions.

8. Describe the invention, preferably with reference to attached drawings:

- **Direct temperature control of the liners in the vacuum chamber by running a temperature controlled fluid through the channels drilled in them (Figures 1,2,3).**
- **No weld or braze joints in the liners exposed to the vacuum and no tools needed to remove the liners from the chamber.**

- **Cathode Liner vac[illegible]seals are at the bottom of the cham[illegible]The O-rings compression for sealing are provided with the Chamber Liner vacuum pull down. No screws has been used for compressing the O-Rings (Figures 1 & 2).**
- **Adhesion of polymer to the liners is further enhanced with the waffle pattern textures of the directly cooled liners areas that are exposed to the plasma.**

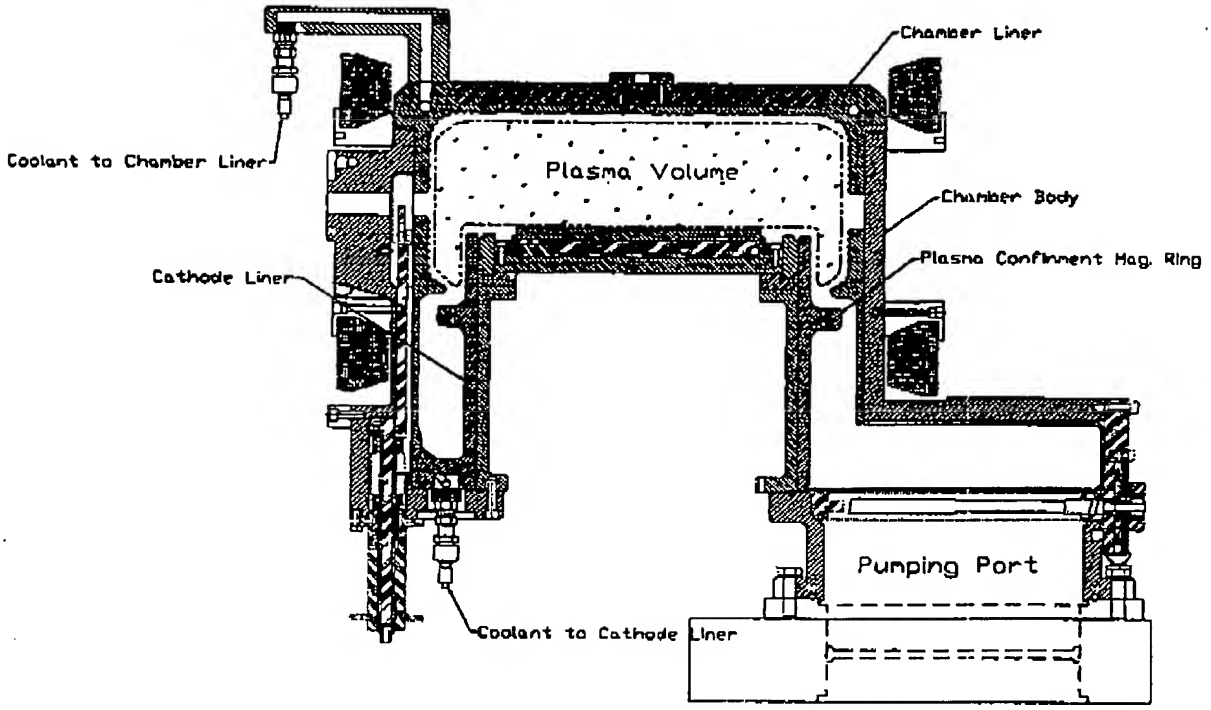

Figure I- Chamber Liner And Cathode Liner Arrangement in the chamber. Notice both liners have coolant channels for temperature control. There are magnets embedded in the Chamber Liner rim to stop the plasma from moving down into the pump plenum. The surface of the both liners in the plasma space are waffled to improve polymer adhesion to the temperature controlled liners surfaces. Also, there is no tools needed for removal of the liners for cleaning.

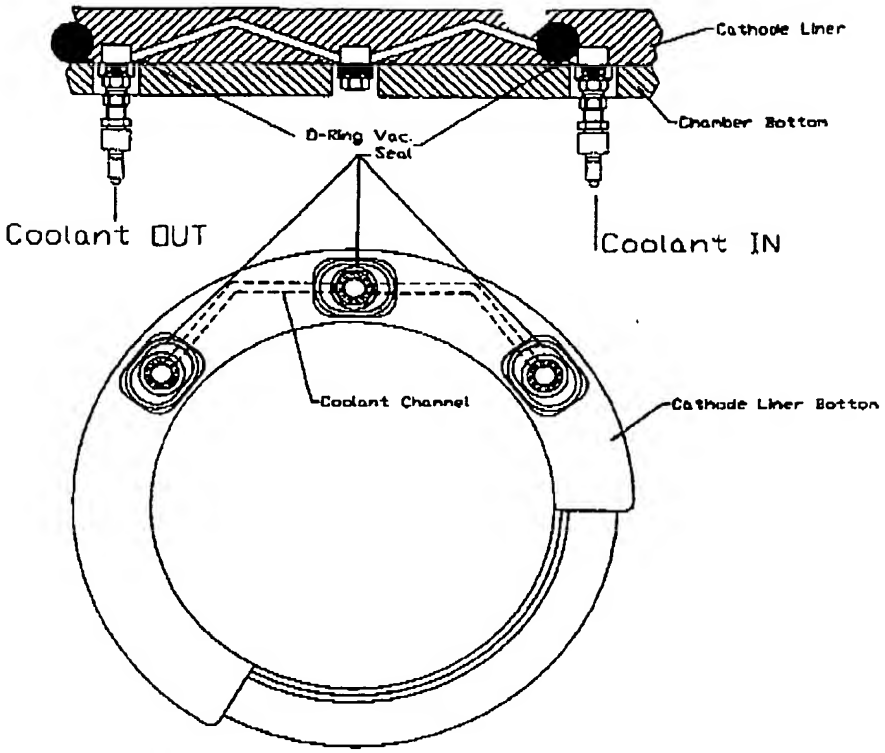

Figure 2: Cathode Liner's coolant channels and vacuum O-Ring seals located at the bottom of the chamber. Notice there are no braze or welded joints in the vacuum chamber.

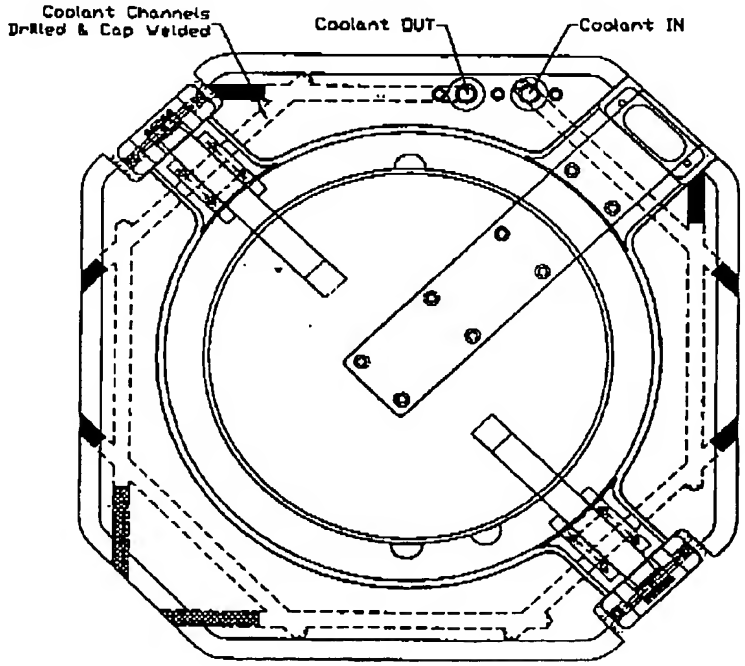

Figure 3: The Coolant channels drilled at top of the Chamber Liner's flange and outside of the vacuum.

9. Provide the following information for EACH inventor:

Inventor #1:

Name: **Hamid Noorbakhsh** Employee # Mail Stop

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Div. Manager: Title:

Div. Product Group: Dept #:

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Inventor #3:

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Inventor #4:
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Inventor #5:
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Product Group: Dept #:

10. Signature, date and **PRINTED** name of each inventor plus two witnesses who have read and understood this Invention Alert form:

Inventors:

Printed Name Hamid Noorbakhsh	Date ⟨DATE⟩	Signature
Printed Name Evans Lee	Date ⟨DATE⟩	Signature
Printed Name Jim Carducci	Date ⟨DATE⟩	Signature
Printed Name Paul E. Luscher	Date ⟨DATE⟩	Signature
Printed Name SIAMAK SALIMIAN	Date ⟨DATE⟩	Signature
Printed Name	Date	Signature
Printed Name	Date	Signature

Witness:

Hamid Noorbakhsh	⟨DATE⟩	
Printed Name	Date	Signature
Mahmoud Dahimene	⟨DATE⟩	
Printed Name	Date	Signature

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